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**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE  
STATE OF CALIFORNIA**

Order Instituting Rulemaking to consider	)	
Alternative-Fueled Vehicle Programs, Tariffs,	)	Rulemaking 13-11-007
and Policies	)	(Filed November 22, 2013)
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**SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) COMMENTS ON ORDER  
INSTITUTING RULEMAKING**

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Pursuant to the Order Instituting Rulemaking (OIR) to Consider Alternative-Fueled Vehicle (AFV) Programs, Tariffs, and Policies, issued November 22, 2013, Southern California Edison Company (SCE) respectfully submits these comments regarding the scope and procedural structure, as well as the specific questions presented in the OIR.

**I. INTRODUCTION**

The Commission issued the OIR to address issues relating to the expanding use of AFVs. This OIR is intended to support the Governor’s Executive Order B-16-2012, which aims to have 1.5 million zero-emission vehicles (ZEVs) on the roads by 2025, and the “ZEV Action Plan,”<sup>1</sup> which identified the Commission as the lead agency on several action items. This proceeding proposes two tracks: the first track will evaluate the potential and value of vehicle-grid integration (VGI) and the second track will focus on the development of new AFV tariffs. Along

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<sup>1</sup> Office of Governor Edmund G. Brown Jr., *2013 ZEV Action Plan* (February 2013), [http://opr.ca.gov/docs/Governor%27s\\_Office\\_ZEV\\_Action\\_Plan\\_%2802-13%29.pdf](http://opr.ca.gov/docs/Governor%27s_Office_ZEV_Action_Plan_%2802-13%29.pdf).

with the OIR, the Energy Division staff also produced a white paper entitled “Vehicle-Grid Integration: A Vision for Zero-Emission Interconnected throughout California’s Electricity System” (White Paper). The White Paper proposes a framework to characterize VGI and help understand the regulatory barriers to the use of electric vehicles as grid resources.

SCE commends the Commission for broadly scoping a flexible proceeding and generally supports the goal and direction of the OIR, but recommends a few changes in Section II below. First, SCE recommends that the OIR should consider additional adoption drivers and focus on near-term, low-cost solutions. Second, SCE proposes a four-track structure that would begin with light-duty plug-in electric vehicles (PEVs), continue with medium- and heavy-duty PEVs, then address all other transportation electrification, and explore natural gas vehicles after transportation electrification has been explored. Finally, SCE requests that the Commission develop and adopt guiding principles for use in a prioritization framework and proposes guiding principles for the Commission’s consideration. After establishing guiding principles, the Commission should prioritize and validate the proposed VGI activities and scenarios.

The OIR requests that stakeholders respond to 13 questions. SCE provides detailed responses to the individual questions in Section III and emphasizes the following:

- Before the VGI framework can be finalized, SCE recommends that Commission staff develop critical guiding principles that will inform and validate the VGI framework, including prioritizing use cases.
- SCE recommends additional VGI uses cases: Increased adoption of time-of-use (TOU) rates, increased use of lower charging levels, and used PEV batteries in stationary applications.
- The Commission should evaluate how rates will encourage or deter workplace charging infrastructure and how rates may affect the load placed on the grid by workplace charging. SCE and other utilities are currently conducting workplace charging studies that will help inform the Commission on these issues.

- SCE believes that utilities can play a role in reducing the PEV total cost of ownership through TOU rates, low carbon fuel standard credits, education programs, and further integrating PEVs into other regulatory proceedings, such as the storage mandate.
- For the reasons discussed below, utilities should not provide acquisition incentives or financing for PEVs or batteries, which is not in the ratepayers' interest and is appropriately the role of financial and other lending institutions.

## **II. OIR SCOPE, STRUCTURE AND GUIDING PRINCIPLES**

### **A. Scope: SCE Supports the Main Elements of the OIR, but Requests that the OIR Include Additional Adoption Drivers and Focus on Near-Term, Low-Cost Solutions.**

SCE appreciates that the OIR is scoped broadly to encompass all issues related to the adoption of AFVs and supports the related items in the Governor's Interagency Zero-Emission Vehicle Action Plan. SCE supports the following elements of the OIR:

- Allows the scope to be amended in the future as the AFV industry and market realities change, while considering an expanded utility role;
- Broadly scoped to include all types of transportation electrification (TE), smart charging, PEV rates, and vehicle- grid integration;
- Does not foreclose the ability of investor-owned utilities to file separate applications for particular pilot programs or RD&D projects;
- Coordinates with other proceedings to avoid duplication (e.g. storage, demand response (DR), smart grid, resource adequacy (RA), and Rule 24).

SCE agrees that adoption of ZEVs is an important part of the OIR and the main goal of the ZEV Action Plan, but the OIR only discusses accelerating AFV adoption in the financing context. SCE recommends that the OIR include a more complete list of key adoption drivers to accelerate the market, including market education, vehicle features, and infrastructure.

SCE requests that the OIR address as an immediate priority how existing storage procurement categories might be modified to better accommodate PEVs.<sup>2</sup> PEVs<sup>3</sup> and other types of TE may be a near-term, lower-cost solution to the same grid challenges that batteries or compressed air as storage attempt to solve (when coupled with compelling marketplace incentives at potentially lower costs to ratepayers and PEV consumers).

In addition, SCE requests that the background section in the OIR regarding local, state, and federal policies be expanded to include additional policies and plans because there is substantially more regulatory pressure for TE, including zero-emission goods movement, than is portrayed in the OIR. Examples include: the State Alternative Fuels Plan,<sup>4</sup> South Coast Air Quality Management District energy policy,<sup>5</sup> the 2012 IEPR update,<sup>6</sup> the Vision for Clean Air study by the California Air Resources Board and two air districts,<sup>7</sup> the 2012 South Coast Air Quality Management District Plan for attainment of the federal 24-hour PM<sub>2.5</sub> standard by 2014,<sup>8</sup> State Freight Sustainability Plan,<sup>9</sup> and the Southern California Association of Governments' Regional Transportation Plan.<sup>10</sup> There are other examples in the Northern California and San Diego regions.

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<sup>2</sup> For example, if PEVs could count in the distribution portion of the storage mandate, this could potentially provide cost savings to ratepayers. In addition, the ZEV Action Plan, p. 5, states that PEV batteries can offer the grid “a large volume of modular, widely dispersed and dispatchable storage capacity for electrical power.”

<sup>3</sup> Including used batteries from PEVs used in stationary applications.

<sup>4</sup> California Energy Commission and California Air Resources Board, *State Alternative Fuels Plan* (December 2007), <http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF>.

<sup>5</sup> Air Quality Management District, *Air Quality – Related Energy Policy* (September 2001), <http://www.aqmd.gov/prdas/climate-change/EnergyPolicyFinal/EnergyPolicyAdopted090911-Clean.pdf>.

<sup>6</sup> California Energy Commission, *2012 IEPR Updated* (2012) Publication Number: CEC-100-2012-001-CMF, <http://www.energy.ca.gov/2012publications/CEC-100-2012-001/CEC-100-2012-001-CMF.pdf>.

<sup>7</sup> California Air Resources Board, *Vision for Clean Air: A Framework for Air Quality and Climate Planning* (June 2012), [http://www.arb.ca.gov/planning/vision/docs/vision\\_for\\_clean\\_air\\_public\\_review\\_draft.pdf](http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf).

<sup>8</sup> South Coast Air Quality Management District, *Air Quality Management Plan* (September 2012), <http://www.aqmd.gov/aqmp/2012aqmp/RevisedDraft/RevisedDraft2012AQMP-Main-clean.pdf>.

<sup>9</sup> California Air Resources Board Initiative, <http://www.arb.ca.gov/gmp/sfti/sfti.htm>.

<sup>10</sup> Southern California Association of Governments, *Regional Transportation Plan* (April 2012), <http://rtpscs.scag.ca.gov/Documents/2012/final/f2012RTPSCS.pdf>.



**B. Structure: SCE Proposes First Focusing on the Light-Duty PEV Market, Then the Medium- and Heavy-Duty PEV Markets, and, Finally, All Other Market Segments.**

The current structure narrowly focuses on solutions to grid needs separately (vehicle-grid integration, rates, financing, submetering, line extension policy, pilots, R&D, and coordination with other proceedings) which makes it difficult to examine the interplay of different potential solutions to various grid challenges. Revising the OIR structure around market segments will enable the Commission to consider a broader range of grid issues and potential solutions more holistically. SCE proposes the following four-track structure (listed in order of priority and timing):

- Track 1: Light duty PEVs: The focus of both the ZEV Action Plan and Rulemaking 09-08-009 are on light duty PEVs, and the majority of the benefits of TE over the next five to ten years are likely to stem from light duty PEVs.<sup>11</sup>
- Track 2: Medium- and heavy-duty PEVs: The ZEV action plan contains action items on medium- and heavy-duty PEVs.<sup>12</sup>
- Track 3: All other transportation electrification.
- Track 4: Natural gas vehicles (NGVs).

Several pending agency documents<sup>13</sup> will examine medium- and heavy-duty PEVs, other types of TE, and NGVs. The OIR can leverage lessons learned by other agencies by addressing medium- and heavy-duty PEVs, all other TE, and NGVs on later tracks. These are important and complex topics with substantial societal benefits, especially in the South Coast Air Basin, and should be given the separate focused attention they deserve.

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<sup>11</sup> Office of Governor Edmund G. Brown Jr., *2013 ZEV Action Plan* (February 2013), [http://opr.ca.gov/docs/Governor%27s\\_Office\\_ZEV\\_Action\\_Plan\\_%2802-13%29.pdf](http://opr.ca.gov/docs/Governor%27s_Office_ZEV_Action_Plan_%2802-13%29.pdf).

<sup>12</sup> *Id.*

<sup>13</sup> Several important efforts are currently underway, including the 2015 South Coast Air Quality Management Plan, the 2016 Southern California Association of Governments Regional Transportation Plan, California Air Resources Board's Sustainable Freight Plan, the California Freight Mobility Plan update, the AB 32 Scoping Plan update, and the California Energy Commission's Integrated Energy Policy Report for 2015.

**C. Proposed Guiding Principles: SCE Recommends that the Commission Develop and Adopt Critical Guiding Principles to Steer the OIR.**

Guiding principles will be critical to effectively prioritizing VGI activities and scenarios. Below, SCE proposes detailed guiding principles for the Commission's consideration. In summary, however, SCE recommends that the OIR:

- Identify near-, mid-, and long-term grid needs and focus on meeting these needs with actions that deliver the highest benefit to cost ratios;
- Initially, focus on low-cost, simple, and near-term solutions to grid needs to help accelerate adoption and increase grid connection;
- Minimize unintended consequences and avoid increasing net consumer costs;
- Adopt a technology-neutral stance for transportation electrification and business model-neutral position for charging and infrastructure technologies;
- Recognize market differences across the state when considering charging infrastructure needs (Level 1, Level 2, and DC Fast charging), their grid benefits, ratepayer savings, and customer usage needs;
- Develop a broad comparison framework which can include non-transportation solutions, similar to a cost framework used by air quality agencies.<sup>14</sup>

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<sup>14</sup> In air quality regulations for mobile sources, the most cost-effective solutions were implemented first (e.g. catalytic converters). Subsequent regulations delivered fewer benefits because they were compared to the cars with catalytic converters. Still later regulations delivered fewer incremental benefits for the same reason. Each set of subsequent regulations was less cost-effective, in part, because they delivered fewer incremental benefits. The same logic should be applied to prioritizing VGI efforts by agencies.

### III. RESPONSES TO OIR QUESTIONS

#### A. Vehicle Grid Integration

1. Is the VGI framework proposed in the White Paper a reasonable way to organize VGI activities and scenarios?

- a) Yes, however, the Commission should develop critical guiding principles to inform and validate the VGI framework and prioritize proposed use cases.

As part of the ISO's VGI roadmap process, SCE proposed guiding principles to organize VGI activities and scenarios.<sup>15</sup> SCE recommends that the Commission develop guiding principles as an essential first step in the VGI process, as this will inform many later steps (e.g., refining the framework, adding use cases, prioritizing use cases, comparing with other technologies). These guiding principles could be developed through a workshop to incorporate input from all stakeholders.

SCE proposes the following guiding principles for the Commission's consideration:

- Focus on Grid Needs (Near-, Mid-, Long-Term) and Target Areas of Largest Benefit (or, if Possible, Best Cost-Benefit Ratio)
  - Understand the relative value and timing of the potential grid benefits<sup>16</sup> of PEVs and broader TE to the marketplace, utilities, and ISO as a necessary first step to prioritizing.

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<sup>15</sup> SCE Letters to California Energy Commission, dated October 15, 2013, November 19, 2013, and December 10, 2013.

<sup>16</sup> Examples include minimizing distribution peaks, daily generation peaks, critical summer peaks, ramping requirements, voltage / frequency issues, and intermittency issues with renewables.

- Identify the largest categories of grid benefits and determine the costs to realize those grid benefits.
- Understand if and when certain VGI benefits will decline because of competition from other grid services (e.g., demand response, compressed air, pumped hydro, stationary batteries) or because of a saturated VGI market (e.g. many cars providing many MW of services).
- Seek to avoid harm to the grid by understanding the risk to the grid and to ratepayers of various end-state scenarios.
- Focus on Low-Cost, Simple, and Near-term Solutions to Grid Needs
  - Focus on light-duty PEVs first with low-cost and simple actions that benefit most of the PEV market and are scalable (e.g. improving rate adoption, low-cost charging solutions, and future codes and standards) and critical path activities (e.g. value analysis and collection of data to inform future policy).
  - Recognize different market dynamics across the state and different market needs of plug-in hybrid electric vehicles (PHEVs) versus battery electric vehicles (BEVs).
- Minimize Unintended Consequences and Do Not Add to Consumer Net Costs
  - The Commission should understand trade-offs and seek to avoid unintended consequences, such as
    - Adding to consumer net costs, including costs from potential stranded assets, networking costs, costs to participate in the grid service, redundant or high back-

office costs, higher costs for charging equipment, and vehicle capabilities/features.

- Counting the same grid benefit twice (e.g. in contracts with the ISO).<sup>17</sup>
  - Interfering with the usefulness of the vehicle (e.g. reducing electric vehicle miles travelled).
  - Adding complexity that could confuse PEV customers, dealers, automakers and other stakeholders.
- Adopt a Technology and Business Model Neutral Position for Charging and Infrastructure Technologies
    - The Commission should not favor one vehicle type<sup>18</sup> over another, and should not favor one infrastructure business model<sup>19</sup> over another, unless there is good reason to do so (e.g., less impact on the grid). For example, recent data shows that some PHEV models are driving more electric miles and providing more societal benefits than BEVs, and many are charging at lower charging levels with less grid impact.
    - Commission policy should continue to allow consumer choice (e.g. rate options, type of TE technology and infrastructure, type of business model)

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<sup>17</sup> ISO presented this concern at the December 4 workshop.

<sup>18</sup> In the light duty segment, the major types of PEVs include PHEVs, BEVs with 70-120 mile range, and BEVs with 200 – 300 mile range. Similar categories exist for medium- and heavy-duty PEVs, as well as overhead wire dual mode and dedicated electric trucks and buses, and inductive or conductive roadway power electric trucks and buses (dual mode and/or dedicated).

<sup>19</sup> Different business models address demand charges in different ways. For example, Tesla provides free charging to members of its “club” and demand charges are recovered as part of purchasing the car. Other business models minimize demand charges at public or workplace charging as part of a building’s energy management system. Still other business models have the charging station as a separately metered account, and this model will likely see higher demand charges compared to others.

- Seek Greenhouse Gas (GHG) and Air Pollution Reduction
  - TE and NGV adoption efforts should focus on cost-effectively seeking greenhouse gas reductions and concomitant reductions in criteria air pollutants. PEVs and other types of TE have very low emissions, typically about 70% less GHG and 99% less air pollution on a well-to-wheels basis. As the ISO staff pointed out at the VGI Workshop, it is possible to further reduce these emissions by shifting the charging load.
- Understand Charging Level Issues (Low versus High kW)
  - The Commission should evaluate the ratepayer benefits of lower charging levels<sup>20</sup> for PEVs, the current market conditions and trends for charging levels, and the limitations of PEVs to provide grid services based on battery size, charging rate, average miles driven, and PEV ranges.<sup>21</sup>
- Understand and Prioritize by Charging Market Segment (Residential, Workplace, Fleet, and Public-Access)
  - The Commission should prioritize addressing charging market segments based on size of potential market, ease of solving market barriers,<sup>22</sup> near-term market potential, cost, and other relevant factors.

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<sup>20</sup> Most PHEVs and some BEVs charge at 1.4 kW (Level 1). The grid impact of 3.3 kW (Level 2) charging is also much less than higher kW charging (Level 2 goes up to 19.2 kW).

<sup>21</sup> For example, a vehicle might charge at a rate of three to four miles per hour at Level 1 or up to 55 miles per hour at Level 2. Defining the benefits and disadvantages from a VGI perspective for charging at these (and other) charging levels is needed.

<sup>22</sup> As an example, it is much more difficult to install charging stations for tenants (business or residential).

- Develop a Broad Comparison Framework that Can Include Non-Transportation Solutions, Similar to a Cost Framework Used by Air Quality Agencies
  - The Commission should develop a robust framework (similar to that used by air quality agencies) where the most cost-effective solutions are secured first, and subsequent solutions are compared incrementally to the earlier solutions.<sup>23</sup>
  - The framework must also allow different agencies to compare VGI to solutions that do not involve vehicles (e.g. compressed air storage, stationary batteries, flywheels).

b) SCE recommends that the White Paper’s VGI framework should be coordinated with the ISO’s VGI framework.

SCE appreciates the coordination between the Commission and ISO staffs on VGI and acknowledges many good ideas are coming from it. SCE appreciates the Energy Division’s effort in developing the White Paper as a starting point for VGI, but recommends that it incorporate learnings from recent workshops hosted by ISO and the California Energy Commission. The California Vehicle-Grid Integration Roadmap: Enabling vehicle-based grid services, Draft November 27, 2013 (Roadmap), includes a characterization framework for VGI that should be included in the Commission’s VGI framework as well. For example, the Roadmap includes “approach (variable pricing, control, etc.), application (distribution system, wholesale markets, etc.) and technology (charger, controls

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<sup>23</sup> In air quality regulations for mobile sources, the most cost-effective solutions were implemented first (e.g. catalytic converters). Subsequent regulations delivered fewer benefits because they were compared to the cars with catalytic converters. Still later regulations delivered fewer incremental benefits for the same reason. Each set of subsequent regulations was less cost-effective, in part, because they delivered fewer incremental benefits. The same logic should be applied to prioritizing VGI efforts by agencies.

type, etc.).” In addition, ISO staff provided many substantive comments at the Energy Division’s VGI workshop held on December 4, 2013. We defer to the ISO staff on how best to incorporate their Roadmap with the Commission’s framework.

**2. Do you agree with Energy Division’s prioritization of the VGI scenarios?**

- a) SCE requests additional dialogue before making a specific proposal on prioritization.

Based on the many diverse comments at the December 4, 2013 workshop on the VGI framework, additional input is needed from the ISO, the utilities, and other stakeholders to develop a more sophisticated framework, additional use cases, and prioritization of the use cases. For example, the ISO staff stated that the VGI White Paper was oversimplified and needed additional use cases. SCE recommends that some of our responses to Question 1 should be applied to the White Paper framework. A future workshop should include discussion of (1) VGI guiding principles, (2) market status and trends, (3) technology status, (4) lessons learned since the launch of PEVs, and (4) R&D needs (including codes and standards).

- b) SCE recommends three additional use cases that may offer simple low-cost and near-term solutions to grid needs.

The White Paper should examine VGI from additional perspectives. At this stage, SCE recommends at least three additional use cases:

- Increased adoption of TOU rates (residential and commercial)
- Emphasis on lower charging levels (through increased consumer education and outreach and new rate design)



- Used PEV batteries in stationary applications where utilities contract with third parties to provide energy for grid services

Including the use of PEV rates as a form of VGI is important because rates are helping vehicles integrate with the grid and solving almost all of the same grid problems as more sophisticated forms of VGI. This applies to residential and commercial rate design encouraging charging off peak or at lower levels.

Similarly, integrating used PEV batteries into the grid, as described above, solves most of the same grid problems as more sophisticated forms of VGI and may offer important benefits to PEV drivers.

c) SCE recommends that consistent nomenclature be developed.

SCE recommends that VGI be broadly defined to include the three new use cases above. SCE also recommends that consistent definitions be developed for “managed charging,” “controlled charging,” “smart charging,” and “V1G.” The three new use cases described above require a clear, consistent definition of VGI in the White Paper, OIR and ISO’s VGI Roadmap. Currently, several different definitions are used by the Commission and ISO:

- The ISO Roadmap includes the adoption of TOU rates and lower charging levels,<sup>24</sup> as well as second use of PEV batteries,<sup>25</sup> as forms of VGI.
- The Energy Division White Paper excludes the three use cases described above. Energy Division staff, however, stated at the

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<sup>24</sup> California Vehicle-Grid Integration (VGI) Roadmap: Enabling vehicle-based grid services: DRAFT Nov 27, 2013, page 5: “Managed charging refers to the technical capability to modulate charging of the vehicle through delay, throttling to draw more or less electricity or switching load on or off.” Vehicles have timers today that can program the car to delay charging to accommodate off or super-off peak rates. Charging at a lower level (e.g. 1.4 or 3.4 kW) instead of 6.6 kW is a permanent throttling to draw less electricity. Page 14 references PEV rate adoption pilots.

<sup>25</sup> *Id.*, page 14.

December 4 workshop that “VGI is meant to be a broad term to capture all of the PEV benefits.”

- The OIR uses the term “VGI” inconsistently, but does include one definition: “strategic PEV battery charging or discharging,”<sup>26</sup> which is broad enough to include programs to encourage adoption of rates for PEVs or lower charging levels.

These discrepancies in definitions for key terms should be resolved, possibly through a workshop with stakeholder input.

### **3. Does the White Paper capture all the utility regulatory barriers to VGI?**

SCE agrees with the White Paper’s four utility regulatory questions and recommends two additional questions:

- Can PEVs (or other TE) assist in meeting other PUC requirements by solving grid issues and providing ratepayer benefits (e.g. storage procurement, renewables integration, resource adequacy, demand response)?
- What are the market needs for manufacturers and consumers to align with VGI needs?

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<sup>26</sup> OIR, page 15.

4. **How should we address any potential safety and reliability concerns associated with VGI?**

- a) SCE does not believe there are very many safety and reliability concerns with “V1G” if defined as optimizing load once it connects to the grid, but recommends a workshop to address potential safety and reliability concerns with V2G.

V2G is an untested technological concept, complicated by limitations on availability and random resource location. Many of the uses listed in the White Paper require significant coordination between the customer and the utility. Given the large volume of PEVs expected in California, significant communication and control infrastructure will be needed to fully realize these benefits. Telemetering and information aggregation requirements will differ between the distribution and transmission systems. Balancing the needs of the transmission system and the wholesale market with the needs of the distribution system will be challenging because it will require significant coordination between grid operators, customers, and third parties. Finally, there will be battery discharge limitations based on multiple factors, such as the specific vehicle, vehicle type, battery capacity, automotive warranty, and the customer’s desired participation level. All of these issues make V2G a good topic for a workshop.

- b) SCE believes that the PEV market is complex and nascent with many uncertainties that require good data for policy decisions such as load and reliability planning.

There are many open questions regarding the PEV market. For example, will the market move towards PHEVs or BEVs? Will it embrace Level 1 or Level 2 charging? Will non-residential charging be free or paid? And will DC fast charging or Level 2 be most common for public charging? Commission decisions

in this OIR should be cognizant of these uncertainties and seek to make no-regrets decisions that protect ratepayers while encouraging PEVs and other types of TE. One tool to aid such no-regrets decision making (suggested in R.09-08-009<sup>27</sup>) is scenario planning. Both energy and transportation planning uses this approach. SCE recommends using this or a similar approach in this OIR to understand the benefits of adopting TE and optimize its load.

- c) SCE recommends additional studies be completed to better determine the impact of a large number of PEVs on the system.

The impact of many PEVs on the distribution system needs to be considered. It is important to consider the cost of service to supply such electrical loads before determining the benefits of technology that can be used to mitigate those loads, which is implied by VGI. Using VGI technology to minimize the system impact from a PEV's own load can potentially be a valuable tool to increase the number of PEVs in California at minimum system cost. This must be studied and demonstrated first, before moving to the more challenging concept of finding value through VGI of PEVs as some type of grid asset, like a capacitor bank or a switch.

SCE has been testing, evaluating, and studying PEVs and their charging infrastructure for 20 years at the EV Technical Center. One of the areas that the Center focuses on is the safety and reliability of charging systems. Charging systems and vehicles have been found to be incompatible due to proprietary communications and controls arising from the lack of national charging communication standards and stakeholders trying to gain an advantage in the marketplace. These tests have uncovered defects that could cause injury or

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<sup>27</sup> R.09-08-009, p. 23.

system malfunction. These issues are typically resolved directly with the suppliers. Such work feeds into standards organizations that SCE supports. It is vital that such efforts continue at a national level since stakeholders have a national, not regional, strategy. Bidirectional, or V2G, charging systems increase the risks. Such systems must incorporate safety controls to prevent electrical shock and system damage in their action as generators. Systems that are designed to synchronize with the electrical grid must have protection to immediately stop power flow when the grid stops, and it must work reliably. Some systems may be designed to work in an isolated grid, and they must incorporate mechanisms to ensure isolation. Creating commercial products in this space will require significant testing, validation, and standardization.

- d) Safety concerns could arise related to expanding TE use, such as interconnection, metering, and distribution system impacts.

Communication of VGI intent and actual interconnection will be critical to ensuring that the SCE system can safely incorporate the new load and/or generation. SCE Rule 2<sup>28</sup> describes electrical service and requires the customer to ensure safe interface of any generation resources within the SCE system. Furthermore, SCE's Electric Service Requirements (ESR) will also need to be followed to ensure consistent and safe interconnection of customer load/generation with the SCE distribution system. For V2G, Rule 21<sup>29</sup> and WDAT<sup>30</sup> interconnection processes and requirements will need to be followed. These tariffs specify the interconnection requirements designed to ensure safe

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<sup>28</sup> SCE Rule 2, <https://www.sce.com/NR/sc3/tm2/pdf/Rule2.pdf>.

<sup>29</sup> SCE Rule 21, [https://www.sce.com/NR/sc3/tm2/pdf/Rule21\\_1.pdf](https://www.sce.com/NR/sc3/tm2/pdf/Rule21_1.pdf).

<sup>30</sup> WDAT: <https://www.sce.com/wps/wcm/connect/503d7a4f-4820-468b-b2e4-1617d33e04e1/WholesaleDistributionAccessTariffv3.pdf?MOD=AJPERES&CACHEID=503d7a4f-4820-468b-b2e4-1617d33e04e1>.

operation of interconnected generators with the intent to protect public safety. Possible mobility and variability of these resources is something that will need to be discussed in much greater detail to ensure that the above requirements are met under all possible conditions. Finally, customer side upgrades must meet National Electrical Code Standards) may need to be upgraded to effectively and safely incorporate VGI.

Proliferation of VGI will inevitably lead the public to be more engaged and interested in understanding sources of electricity. It will be important that consumers understand not only the benefits, but also the very real potential safety hazards presented by VGI. SCE recommends that more work be done to develop safe practice standards and understand how to best educate the public on the importance of treating all electrical equipment with the proper caution.<sup>31</sup>

## **B. Alternative Fuel Vehicle Rate Design Policy**

### **1. What is the utility experience to date regarding customer election to use PEV-specific tariffs?**

Currently, SCE estimates that there are approximately 16,000 customer-owned PEVs within SCE's service territory. Approximately 3,700 customers, or 23%, are participating in one of the two available TOU rates for residential customers with PEVs. SCE is currently designing new tariffs, which it will file in its 2013 Rate Design

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<sup>31</sup> For example, the SCE process for interconnecting Net Energy Metering (NEM) customers includes a review of diagrams describing the connection points to the utility system and includes selective field spot checks to ensure compliance with SCE's electrical service requirements. These requirements are intended to ensure that services are designed for safe and reliable installations for both SCE's customers and utility personnel. While SCE continually attempts to improve processes to accommodate higher volumes of NEM installations, SCE has also worked to educate contractors and municipal jurisdictions about violations of electrical service requirements and potential violations of the National Electric Code. Violations of the aforementioned requirements can result in (but are not limited to) (1) reduced productivity due to multiple inspections of a single facility; (2) reduced operational flexibility due to improper system design, construction, etc.; (3) possible system damage and/or injury of SCE customers or utility personnel due to improper NEM system design, construction, etc.

Window, to update its TOU rates for PEV customers and continue to pass through lower costs of off-peak and super off-peak charging.

**2. What issues need to be considered when designing PEV rates for residential charging?**

The cost of fueling PEVs is a significant adoption driver. Customers will be more likely to consider buying a PEV if they have a clear understanding of their operating costs and if they trust that these costs will remain markedly lower than gasoline costs.

In addition, PEV rates should encourage off-peak charging without requiring any radical load shifting. For instance, in Southern California, many inland households may need to use air conditioning during daytime. These same households can easily charge their vehicles off-peak and overnight using the programming feature included in most PEVs. If these customers do not find any benefit in switching to a PEV rate plan because on-peak rates appear to exceed their current standard residential rates, they will likely remain on their current rate plan. On the standard tiered residential rate plan, these customers will likely plug-in whenever they are home. As long as PEV rates compete with non-TOU rates, PEV rates will need to become more attractive or customers will simply remain on their current rate plans.

As a result, SCE is attempting to design easily understood TOU rates that will encourage participation of customers with electric vehicles. In developing PEV rates, some important principles to consider include development of cost-based rates that provide a reasonably long time-of-use charging period, and rates that encourage super off-peak charging while increasing the attractiveness of the rates to current and potential PEV owners while retaining the rate design principles adopted by the Commission.

D.11-07-029 ordered a separately metered PEV rate that includes a meter charge for its separately metered rate schedule and the elimination of pricing tiers within SCE's existing "whole house" TOU-EV rate, stating that "a single meter Electric Vehicle rate

motivates a customer to better manage the peak impacts of the entire household's electricity usage, not just the energy used for Electric Vehicle charging.”<sup>32</sup> R.09-08-009 also recognized that inverted block tiered rates (increasing price for additional kwh consumed) provide a disincentive to increasing electricity usage for PEV use, which runs counter to California's PEV goals, especially if PEV customers charge off peak.<sup>33</sup> In its 2013 Rate Design Window application, SCE will propose the addition of a meter charge to the existing TOU-EV-1 rate option,<sup>34</sup> and introduce a simplified “whole-house” non-tiered TOU rate option designed to benefit ten hour super off-peak charging at Level 1.

**3. Should the Commission consider new rate tariffs for workplaces providing PEV charging?**

SCE does not have access to enough relevant data to provide a definitive answer to the question posed by the Commission, but SCE recommends that the Commission consider the impact of rate tariffs on workplace charging at two different levels:

- The Commission should determine if rate tariffs could encourage or prevent the deployment of workplace charging infrastructure.
- The Commission should consider how rate tariffs may affect usage of workplace charging installations by employees and the resulting impact of workplace charging load on the grid.

To help inform the Commission's assessment, SCE offers the following comments:

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<sup>32</sup> D.11-07-029, p. 21.

<sup>33</sup> D.11-07-029, pp. 17-18.

<sup>34</sup> Pursuant to guidance in D.11-07-029, p. 48.



a) Most PEV charging is expected to occur at home.

Most PEV owners cannot rely on out-of-home solutions to expand the range of their PEVs with certainty on a daily basis. Even if an employee has access to workplace charging today, the employee may have to move to a different work location in the future (either voluntarily with a new job opportunity or involuntarily if the employer relocates to a new facility) and will not have the same assurance that the new location has any charging infrastructure. Also, workplace charging stations may not be available every day; they can be used by other vehicles or out-of-order.

The availability of workplace charging may not be much of an issue to most PEV owners. For 75% of the United States population, the daily roundtrip to work is less than 30 miles with 60% driving 20 miles or less; the national average of daily miles driven reaches 29 miles<sup>35</sup>. This means that most PEV drivers may only need to charge once a day at home, preferably overnight. PHEV and BEV drivers are not in the same situation and the Commission should make sure to evaluate these issues according to the type of PEV technology adopted (PHEV vs. BEV), not just the general PEV category.

- PHEV owners can use gasoline whenever their battery is depleted. As such, they do not face any range anxiety as long as they can refuel at a gas station. However, PHEV batteries usually provide from 10 to 40 electric miles on a single charge, which may be less than the PHEV owner's daily commute. PHEV owners who have access to workplace charging have the opportunity to extend their daily electric range and avoid using gasoline on a daily basis.

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<sup>35</sup> Source: National Household Travel Survey, <http://nhts.ornl.gov>.

- On the contrary, BEVs have a much larger battery capacity, usually sufficient to cover at least twice the national daily average commute. For BEV owners who drive an average commute, access to workplace charging could contribute to shifting their charging load from overnight/off-peak to daytime and, in some cases, on-peak, without improving their daily electric miles traveled.

b) Complexity and initial set-up costs appear to be a significant barrier to deploying workplace charging infrastructure.

SCE is not aware of any data showing that current electricity rates are a barrier to deploying workplace charging infrastructure. Rather, SCE's own experience and anecdotal evidence suggest that the cost and complexity of installing charging stations could be a significant barrier to the deployment of workplace charging infrastructure. While the cost of the charging stations can exceed \$5,000 per unit, far higher costs may have to be spent on construction and installation. When no pre-existing electric infrastructure is available (stub-outs, wiring, panel, etc.), the cost of trenching can be significant. Other logistical issues may include determining the appropriate number of charging stations to deploy (with the risk of overbuilding or underbuilding) and redesigning parking spaces (to leave room for the charging stations and to meet state and local requirements). Finally, organizations that do not own their facilities will have to work with building owners to achieve any deployment. It will often take a very committed management to overcome these barriers.

- c) Electrical rates applicable to workplace charging may not be reflected in the cost (if any) paid by end users.

Employers may qualify as electric vehicle service providers and are free to make workplace charging installations available to their employees at any "price" they choose.<sup>36</sup> Some of the pricing options available to employers may include providing charging for free, at an hourly rate, based on actual usage (with or without a time variant), or for a monthly flat fee. In many cases, the charging costs paid by employees may not reflect the actual cost of electricity paid by employers.

Networked charging stations may also have Demand Response (DR) capabilities. Employers (or the organization managing the employers' workplace charging stations) may modify pricing or the load served to PEV users (e.g., throttling from 240v to 120v) in response to a DR event.

As part of its own Workplace Charging DR pilot,<sup>37</sup> SCE will collect usage data resulting from testing various pricing combinations. The data should provide information regarding the impact of these pricing combinations on usage, including the elasticity of demand for workplace charging by employees.

- d) The Commission should provide additional time to collect data and assess the impact of rates on workplace charging.

As of December 3, 2013, SCE had 47 commercial customers on one of its PEV TOU rates, some of which may be used to charge golf carts and neighborhood electric vehicles only. Other than for this limited group of commercial customers, SCE cannot consistently track workplace charging

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<sup>36</sup> D.10-07-044, p. 40.

<sup>37</sup> Approved by the Commission in D.12-04-045, p. 179.

deployment and usage. Commercial customers may not need to engage with SCE to deploy workplace charging unless the new infrastructure results in a substantial change to their electric load. Based on the feedback received from those business customers who contacted SCE, SCE estimates that a limited number of commercial customers have deployed workplace installation; commercial customers tend to focus on providing charging installations to their retail customers.

Also, starting in January 2014, all commercial customers will be defaulted to a TOU rate, which may potentially impact new workplace charging deployment and how employers choose to transfer electricity costs related to workplace charging to employees.

SCE recommends that the Commission engage with the utilities to gather more data on workplace charging. Conducting workshops, reviewing usage data from SCE's and other utilities' pilots, and potentially surveying commercial customers should help inform a future decision by the Commission.

**4. How can residential and workplace PEV rates incentivize smart charging and allow controlled charging?**

SCE requests clarification on the definitions of “controlled charging” and “smart charging” as the OIR uses them synonymously to refer to vehicle charging that involves communication between the vehicle and grid services provider.

If controlled charging includes adoption of rates that encourage a lower impact of vehicles on the grid, then existing commercial rate schedules with demand charges already encourage charging at lower kW for workplaces.<sup>38</sup> This is because demand charges send a price signal that encourages charging at lower levels. For example, about

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<sup>38</sup> Most commercial rates in SCE's tariffs have demand charges.

4.5 PEVs charging at 1.4 kW equal one PEV charging at 6.6 kW and most PHEV and some BEV owners find 1.4 kW to be what they want and need. Similarly, existing rates for commercial customers also encourage charging at off-peak or super off-peak times.<sup>39</sup>

Regarding controlled charging at residences, SCE is filing new rates designed for PEV customers by the end of 2013. See answer to Question 2 in this section above.

**5. How should the Commission address demand charges for medium- and heavy-duty plug-in electric vehicles?**

Demand charges are a fixed charge component of all SCE's commercial rates, intended to collect revenue associated with fixed generation capacity distribution system related costs. The inclusion of demand charges within commercial PEV rates sends an appropriate pricing signal to customers regarding infrastructure costs. Demand charges also provide more efficient cost recovery by imposing an appropriate allocation of cost recovery on those customers who make a greater contribution due to larger demands and distribution costs. Rates that only reflect volumetric charges can lead to cost shifting when customers are able to avoid their allocated share of fixed cost recovery by reducing volumetric consumption. This type of a shift represents movement away from marginal cost-based rate design where rates are determined based on the nature of primary cost drivers. In this case distribution is the sum of non-coincident peak demands. However, SCE also realizes that demand charges do pose a challenge for nascent high-power, low load-factor, charging business models, such as some municipal electric bus programs. In an effort to facilitate market participation by customers and providers of services to electric vehicle owners, SCE proposed to allow zero-emission electric buses to receive service on the TOU-GS-1 rate for a period of three years. This solution eliminates demand charges, but still imposes time-of-use rate signals to encourage off-peak

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<sup>39</sup> For example, the TOU-EV-4 rate schedule has a facility-related demand charge.

charging.<sup>40</sup> SCE notes that this solution provides an advantage to one electric transit technology over other types,<sup>41</sup> which, in a mature market, should be avoided.

**6. What changes, if any, are needed to tariffs related to compressed natural gas vehicles?**

SCE has no comment on this subject.

**7. What other issues related to alternative fuel vehicle rates should the Commission address?**

SCE requests that PEV rates be neutral to technology and business models. As stated earlier, rates should be recognized as an important tool for addressing VGI issues in a simple, low-cost, and scalable manner (e.g. increased adoption of TOU rates and lower charging levels).

Adoption of optional rates designed to encourage VGI activities including lower charging levels and super off-peak charging are within the definition of storage (under PEVs or permanent load shift) in AB 2514,<sup>42</sup> D.12-08-016,<sup>43</sup> and D. 13-10-040.<sup>44</sup> As such, more discussion in future workshops is needed. Additional topics at these workshops could include the lessons learned from the various PEV rate pilots in California and other states and ISO suggestions on rates.

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<sup>40</sup> SCE Advice Letter 2699-E-A, approved by Resolution E-4514.

<sup>41</sup> Some electric bus technologies would not incur high demand charges, including battery electric and plug-in hybrid electric buses that charge off-peak.

<sup>42</sup> Pub. Util. Code § 2835(a).

<sup>43</sup> D.12.08-016, pp. 27-28.

<sup>44</sup> D.13-10-040, pp. 5, 14, 28, 32, 75, and Appendix A, p. 5.

## C. Financing

### 1. Should the Commission direct the utilities to provide financing to customers to encourage PEV adoption? If so, what financing options should be considered?

As discussed above, SCE is committed to the success of the PEV market and the efficient and cost-effective connection of transportation to the electrical grid.

Furthermore, providing momentum to this nascent market is essential. Where possible, the Commission should focus on low-cost solutions that promote greater understanding and awareness of PEV ownership to consumers. The Commission should ensure, however, that these solutions *simplify*, rather than complicate, consumers' decision-making process. Because the Commission does not define "financing," SCE discusses two potential routes for increasing PEV adoption, one of which may be appropriate for utility participation.

#### a) Utilities may play a role in reducing total cost of PEV ownership.

Although not traditional financing, parties have explored ways of reducing total cost of PEV ownership to increase adoption. Utilities can play a role in reducing total cost of PEV ownership in several ways. As an ongoing fuel provider to PEVs, SCE continues to explore PEV rate options, such as improved and more widely adopted TOU rates, or a potential fuel "dividend" program funded by low carbon fuel standard (LCFS) credits, both of which could lower customers' effective cost of ownership.<sup>45</sup> Utility programs that encourage wider awareness and availability of lower level charging could also reduce total cost of

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<sup>45</sup> Customers already will benefit from monthly savings by switching from higher-cost gasoline to electricity as a fuel.

ownership.<sup>46</sup> Finally, customer value could be realized by integrating PEVs as a compliance option in the new storage procurement requirement, which could reduce PEVs' total cost of ownership.<sup>47</sup>

b) Utilities should not provide financing or credit enhancements to financing for PEVs or batteries.

Financing PEVs and vehicle batteries is not a necessary or proper role for utilities. In addition to legal barriers to utility financing,<sup>48</sup> auto manufacturers and dealers are better positioned to provide these services at the point of sale as part of their core business. Further, utilities are an uneconomical alternative lending source because they have a much higher cost of capital than financial institutions and others who traditionally provide financing.

Utilities similarly should not be providing credit enhancements or acquisition incentives for PEVs or vehicle batteries. This role is already ably served by the federal and state governments that provide up to \$10,000 in combined incentives,<sup>49</sup> and auto manufacturers and dealers that provide zero or low interest financing and lease incentives.<sup>50</sup> Utility involvement in the acquisition transaction would further crowd the list of parties involved, potentially complicating lease or purchase agreements and confusing customers.<sup>51</sup>

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<sup>46</sup> Lower level charging can reduce certain costs associated with higher level charging, such as demand charges, equipment costs, and potential electrical upgrade costs.

<sup>47</sup> One example of how this could work is the Pacific Gas and Electric Company proposal where automakers enter a long term contract for grid services (through the PEV or used batteries). The automakers would also finance the batteries or cars and provide customers an incentive to reduce the total cost of ownership. If these grid services prove more economical than other alternatives, utility ratepayers would also benefit from reduced utility costs.

<sup>48</sup> The utilities' existing financing programs are limited to non-residential customers due to state and federal lending laws.

<sup>49</sup> There is a Federal tax credit of up to \$7,500 as well as a California state rebate ranging from \$1,500 to \$2,500.

<sup>50</sup> For example, as of 12/06/13 the Nissan Leaf, Chevrolet Volt and Toyota Prius were all advertising 0% financing options on their respective websites.

<sup>51</sup> SCE notes, for example, that only three out of four qualified PEV owners in SCE's service territory had applied for the California state rebates as of October 31, 2013.



Utility involvement in the acquisition transaction is unnecessary because the market is aptly served, and will likely complicate lease or purchase agreements and confuse customers, thus deterring rather than attracting them to PEV purchases.

**D. General**

**1. What changes to the Commission's Rules or new Rules are needed to facilitate the goals outlined in this OIR?**

SCE expects to have further comments on this issue at later stages in the proceeding. Initially, SCE notes that the OIR should address significant differences between Commission policy from the past low-emission vehicle (LEV) decisions and the more recent decisions in R.09-08-009 on topics such as education and outreach, promotion, R&D, duplication, and investor-owned utility ownership of equipment on the customer-side of the meter.<sup>52</sup> The LEV decisions apply broadly to all types of TE and NGVs;<sup>53</sup> while the AFV decisions were narrowly focused on light-duty PEVs.<sup>54</sup>

SCE also notes that the more recent Commission AFV decisions are more restrictive of the utility role than the earlier LEV decisions.<sup>55</sup> However, significant state policy changes were not factored into the Commission's recent AFV decisions. Examples of these policy changes include 1) SB 76, which changed the definition of ratepayer benefits for PEVs and NGVs to include factors such as environmental benefits;<sup>56</sup> 2) Executive Order B-16-2012, which calls for 1.5 million PEVs by 2025; and

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<sup>52</sup> See D.11-07-029, pp. 38-40.

<sup>53</sup> D.93-07-054, p. 13; D.95-11-035, p. 12.

<sup>54</sup> D.10-07-044, p. 1; D.11-07-029, p. 88.

<sup>55</sup> D.95-11-035, pp. 1, 50.

<sup>56</sup> SB 76 added PU Code 740.8.

3) the ZEV Action Plan, which has over 100 action items for state agencies to meet the goals of the Executive Order.

Finally, SCE recommends that policy development on AFVs should seek to provide similar guidance for both electric transportation and natural gas transportation, unless there are good reasons to distinguish the two.

#### **IV. CONCLUSION**

SCE appreciates the opportunity to provide these comments in response to the OIR and looks forward to working closely with the CPUC and other stakeholders to support Executive Order B-16-2012 and meet the goals in the Governor's ZEV Action Plan.

Respectfully submitted,

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*/s/ Andrea L. Tozer*

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